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TITLE: Microspot test methods and field test kit for  
on-site inspections of  
chemical agents

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INVENTOR-INFORMATION:

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CLAIMS:

What is claimed is:

1. A method of detecting the presence of chemical warfare  
agents, precursors and  
degradation products thereof, consisting of:

contacting a liquid sample suspected of containing a member  
of the group consisting  
of chemical warfare agents, chemical warfare agent  
precursors, chemical warfare  
agent degradation products and mixtures thereof with a  
sufficient amount of a  
chromatographic adsorbent material and a sufficient amount  
of a chromogenic  
detector reagent, wherein said contacting comprises  
applying said sample via a  
microcapillary tube to said chromatographic adsorbent,

whereby a chromogenic indicator is formed when said sample  
contains said member of  
said group.

2. The method of claim 1, wherein said sample comprises a  
solution.

3. The method of claim 1, wherein said contacting comprises reacting from about 0.1 to about 10 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

4. The method of claim 1, wherein said contacting comprises reacting from about 0.5 to about 5 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

5. The method of claim 1, wherein said contacting comprises reacting from about 1 to about 3 microliters of said sample with said chromatographic adsorbent material and said chromogenic detector reagent.

6. The method of claim 1, wherein said member is selected from the group consisting of ethyl N,N-dimethylphosphoramidocyanate (GA), isopropyl methylphosphonofluoridate (GB), pinacolyl methylphosphonofluoridate (GD), cyclohexyl methylphosphonofluoridate (GF), O-ethyl S-(2-diisopropylamino)ethyl methylphosphonothiolate (VX), bis(2-chloroethyl)sulfide (HID), bis[2-(2-chloroethylthio)ethyl]ether (T), 2-chlorovinylldichloroarsine (L), methylphosphonic difluoride (DF), ethyl 2-(diisopropylamino)ethyl methylphosphonite (QL), isopropyl methylphosphonic acid (IMPA), pinacolyl methylphosphonic acid (PMPA), cyclohexyl methylphosphonic acid (CMPA), methylphosphonofluoridic acid (MPFA), methylphosphonic dichloride (DC), S-(2-diisopropylamino)ethyl methylphosphonothioic acid (EA 2192), ethyl methylphosphonic acid (EMPA), O-ethyl methylphosphonothioic acid (EMPTA), 1,4-dithiane (DITHANE), 2-chlorovinylarsenious oxide (L-OXIDE) and methylphosphonic acid (MPA).

7. The method of claim 1, wherein said chromogenic detector reagent is selected from the group consisting of bromcresol green,

7,7,8,8-tetracyanoquinodimethane,  
(TCNQ), gold chloride, gold chloride/ NaOH solution,  
cholinesterase/indoxyl acetate,  
4-(4'-nitrobenzyl) pyridine/NaOH, sodium pyrophosphate  
peroxide/aromatic amine,  
o-dianisidine/sodium perborate, potassium bismuth iodide,  
1,3-diisonitrosoacetone  
guanidinium salt, bis(diethylamino)benzophenone oxime,  
bis(diethylamino)benzophenone,  
bis(dimethylamino)thiobenzophenone, phenylazoformic  
acid 2-diphenylhydrazide, diphenylcarbazone,  
diphenylthiocarbazone, mercuric salt,  
diethyldithiocarbamic acid silver salt,  
2,2'-dithiobis(5-nitropyridine), molybdenum  
oxide in sulfuric acid, ammonium molybdate, iodine/starch,  
and sulfuric acid (4M).

8. The method of claim 1, wherein said microcapillary tube  
has a cross-sectional  
diameter of from about 0.05 to about 0.7 millimeters.

9. The method of claim 1, wherein said microcapillary tube  
has a cross-sectional  
diameter of from about 0.1 to about 0.4 millimeters.

10. The method of claim 1, wherein said microcapillary  
tube has a cross-sectional  
diameter of from about 0.2 to about 0.25 millimeters.

11. The method of claim 1, wherein said chromatographic  
adsorbent material is a  
thin layer chromatography plate.

12. The method of claim 11, wherein said thin layer  
chromatography plate includes  
adsorbent selected from the group consisting of silica gel  
and alumina.

13. The method of claim 11, wherein said thin layer  
chromatography plate includes  
backing material selected from the group consisting of  
glass, plastic and aluminum.

14. A kit for chromogenically detecting the presence of  
chemical warfare agents and  
degradation products thereof, consisting of:

(a) microcapillary tube means for applying a liquid sample

suspected of containing  
a member of the group consisting of chemical warfare  
agents, precursors and chemical  
warfare agent degradation products and mixtures thereof;

(b) a sufficient amount of a chromatographic adsorbent  
material; and

(c) a sufficient amount of a chromogenic detector reagent.

15. The kit of claim 14, wherein said member is selected  
from the group consisting  
of ethyl N,N-dimethylphosphoramidocyanate (GA), isopropyl  
methylphosphonofluoridate  
(GB), pinacolyl methylphosphonofluoridate (GD), cyclohexyl  
methylphosphonofluoridate  
(GF), O-ethyl S-(2-diisopropylamino)ethyl  
methylphosphonothiolate (VX),  
bis(2-chloroethyl)sulfide (HD),  
bis[2-(2-chloroethylthio)ethyl] ether (T),  
2-chlorovinylldichloroarsine (L), methylphosphonic  
difluoride (DF), ethyl  
2-(diisopropylamino)ethyl methylphosphonite (QL), isopropyl  
methylphosphonic acid  
(IMPA), pinacolyl methylphosphonic acid (PMPA), cyclohexyl  
methylphosphonic acid  
(CMPA), methylphosphonofluoridic acid (MPFA),  
methylphosphonic dichloride (DC),  
S-(2-diisopropylamino)ethyl methylphosphonothioic acid (EA  
2192), ethyl  
methylphosphonic acid (EMPA), O-ethyl methylphosphonothioic  
acid (EMPTA),  
1,4-dithiane (DITHIANE), 2-chlorovinylarsenious oxide  
(L-OXIDE) and methylphosphonic  
acid (MPA).

16. The kit of claim 15, wherein said chromogenic detector  
reagent is selected from  
the group consisting of bromcresol green,  
7,7,8,8-tetracyanoquinodimethane, (TCNQ),  
gold chloride, gold chloride/ NaOH solution,  
cholinesterase/indoxyl acetate,  
4-(4'-nitrobenzyl) pyridine/NaOH, sodium pyrophosphate  
peroxide/aromatic amine,  
o-dianisidine/sodium perborate, potassium bismuth iodide,  
1,3-diisonitrosoacetone  
guanidinium salt, bis(diethylamino)benzophenone oxime,  
bis(diethylamino)benzophenone,

bis(dimethylamino)thiobenzophenone, phenylazoformic acid 2-diphenylhydrazide, diphenylcarbazone, diphenylthiocarbazone, mercuric salt, diethyldithiocarbamic acid silver salt, 2,2'-dithiobis(5-nitropyridine), molybdenum oxide in sulfuric acid, ammonium molybdate, iodine/starch, and sulfuric acid (4M).

17. The kit of claim 4, wherein said chromatographic adsorbent material is a thin layer chromatography plate.

18. The kit of claim 17, wherein said thin layer chromatography plate includes adsorbent material selected from the group consisting of silica gel and alumina.

19. The kit of claim 17, wherein said thin layer chromatography plate includes backing material selected from the group consisting of glass, plastic, or aluminum.

20. The kit of claim 4, wherein said means for obtaining a sample comprises a capillary tube.

21. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.05 to about 0.7 millimeters.

22. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.1 to about 0.4 millimeters.

23. The kit of claim 20, wherein said microcapillary tube has a cross-sectional diameter of from about 0.2 to about 0.25 millimeters.

24. The kit of claim 21, wherein said microcapillary tube is capable of delivering from about 0.1 to about 10 microliters of said sample.

25. The kit of claim 22, wherein said microcapillary tube is capable of delivering from about 0.5 to about 5 microliters of said sample.

26. The kit of claim 23, wherein said microcapillary tube is capable of delivering

from about 1 to about 3 microliters of said sample.